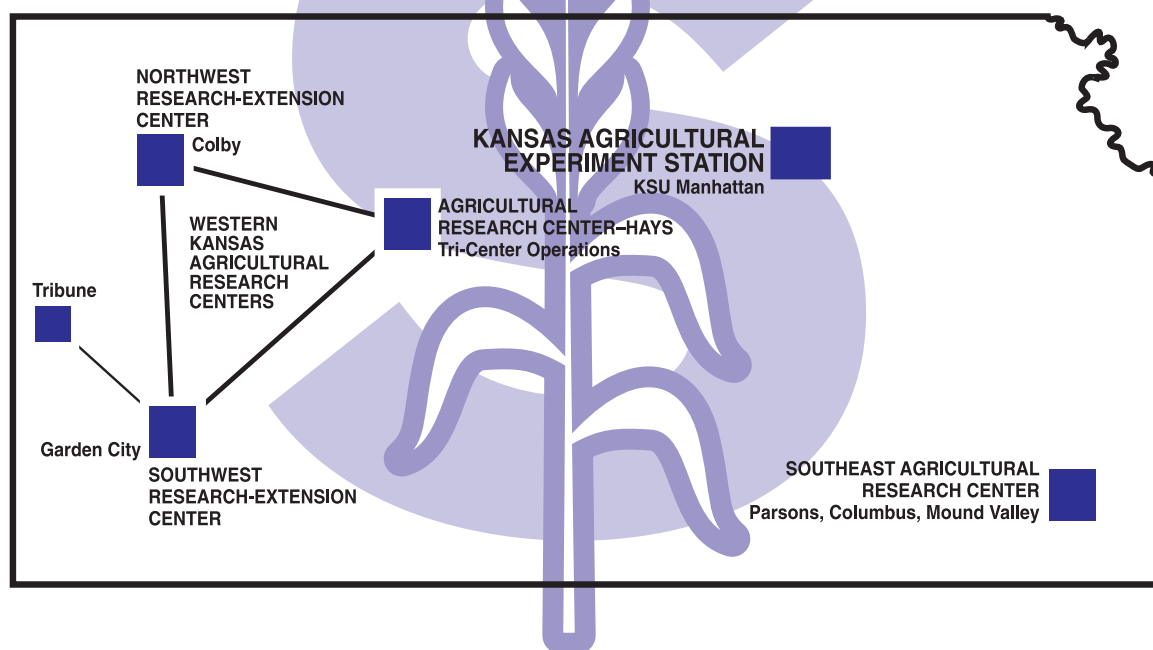


Economic Issues with Certified and Farmer-Saved Wheat Seed



Agricultural Industry Competitiveness

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Economic Issues with Certified and Farmer-Saved Wheat Seed

Recently, several food and agribusiness firms began offering economic incentives for identity-preserved wheat in Kansas. In addition, newly released hard white wheat varieties from K-State Research and Extension must be kept separate from hard red wheat varieties. One key component of the marketing contracts used to purchase this identity-preserved wheat is the need to document the source of the wheat seed. At the present time, all of these contracts require the use of certified seed. This publication provides an overview of economic issues associated with using certified and farmer-saved wheat seed.

Overview of Certified and Farmer-Saved Seed

Certified seed from public varieties and private companies is defined as seed that has passed field inspection and seed testing standards for varietal purity, which is the absence of certain wheat and other crop seeds, and certain diseases. In addition, most certified seed has been treated with a fungicide to control seed-borne and seedling diseases. In most cases, certified seed must exceed 90 percent germination.

Noncertified seed is typically referred to as farmer-saved or homegrown seed (TeKrony). Within this category, there are three different types of seed. Bin-run seed is seed that producers have held back to plant next year's crop. With bin-run seed, no seed cleaning, treatment, or testing has been done prior to planting. Custom-cleaned seed is farmer-saved seed that has been cleaned by a custom conditioner, but not treated. Custom-cleaned seed may or may not have been tested for germination and is not usually tested for purity and weed seed contamination. Finally, some farmer-saved wheat seed is custom cleaned, treated, and sometimes tested.

Stanelle et al. found that 82 percent of the farmer-saved wheat seed planted in Kansas had been cleaned prior to planting and 36 percent of the seed had been treated with a fungicide. Only 18 percent had been tested for germination or purity by a laboratory before planting, although many of the respondents had performed tests on their farm. The same study found use of certified seed highest in the eastern third of Kansas (ranging from 31 to 43 percent) in contrast to the western crop reporting districts where certified seed use was as low as 5 percent (ranging from 5 to 20 percent). Almost 60 percent of the producers reported planting two or more varieties.

Benefits of Certified Seed

Numerous university studies cite the benefits of using certified seed (Shroyer, Kok, and Thompson; Brick). Land grant universities, such as Kansas State University, typically release seed of a new variety to certified seed growers who produce and sell certified seed to wheat producers. After planting a certified seed variety for the first time, producers often keep some wheat for use as seed in the following year (farmer-saved seed). This is possible because wheat is not a hybrid crop.

Purity Issues

Certified seed is more "pure" having less weed seed or foreign material compared to farmer-saved seed because it has been cleaned, but it also has higher costs. Few producers plant certified wheat seed on all of their acres. The overwhelming majority of producers plant certified seed the first year and then use farmer-saved seed for 1 to 2 years, at which time seed purity declines and then they purchase certified seed again. Stanelle et al. reported that 9, 14, and 35 percent of producers in western, central, and eastern Kansas, respectively, used certified seed in 1984. However, an additional 54 percent of western Kansas producers, 67 percent of central Kansas producers, and 51 percent of eastern Kansas producers planted farmer-saved seed that was only 1 or 2 years removed from being certified. Even if producers can maintain seed purity of farmer-saved seed through proper cleaning and treatment, they still may choose to plant certified seed to take advantage of newly released varieties that have the potential to increase yields and the quality of the wheat. For example, Barkley and Porter found that the percentage of acres planted to an individual variety was negatively related to the age of the variety (years from release).

Yield Advantage

Research on certified and farmer-saved seed has focused on the benefits of certified seed, including the yield advantage of certified seed and the agronomic disadvantages of farmer-saved seed that might come with poor seed purity. The Georgia Crop Improvement Association's (GCIA) Small Grain-Drill Box Survey found that certified wheat seed had a yield premium of 3 bushels per acre over bin-run seed resulting in a \$6.75 per acre return over the cost of certified seed. That study found that of the bin-run samples randomly

collected, the majority (62 percent) had severe mechanical (seed damage) and varietal purity problems.

A USDA Economic Research Service study used data from the 1986/87 and 1987/88 *Cropping Practices Survey* to estimate wheat yields per acre in the Great Plains as a function of choice of crop rotations, seeding rate, nitrogen fertilizer application rate, herbicide use, manure use, and farmer-saved seed (Knudson and Hansen). In this study, the use of certified seed provided a 3.5 bushel per acre yield advantage in 1986/87 but only a 1.2 bushel advantage in 1987/88. The 3.5 bushel per acre advantage in 1986/87 was statistically significant in explaining wheat yield differences, however, the 1.2 bushel advantage in 1987/88 was not statistically significant. This study provides some evidence of the yield potential certified seed has over bin-run seed but it also shows that yield differences vary from year to year.

Producers rely on certified seed when environmental conditions prohibit saving harvested grain for seed. Wheat disease concerns provide additional incentive for wheat producers to plant certified seed (Bowden). Planting certified seed, however, does not guarantee yield because environmental factors such as weather may cause partial or total crop loss.

Estimated Cost of Certified and Custom Cleaned and Treated Wheat Seed

In order to better understand the market for certified and farmer-saved seed, the cost of certified wheat seed and custom cleaned and treated wheat seed was estimated using USDA data.

Certified Wheat Seed Cost Estimate

The April price of certified winter wheat seed was collected from the United States Department of Agriculture Economic Research Service's (ERS) *Agricultural Resource and Environmental Indicator Update* (AREI). This certified-seed data represents seed sold by private companies at retail farm stores.

Many seed growers sell certified seed of public varieties, which are developed by land grant universities, to neighboring farms. This certified seed is likely priced lower than seed from private varieties sold by farm store retailers because public varieties are released to certified seed growers for the variable costs of bagging and distributing the seed.

Some of the costs of developing public varieties are funded by producer organizations such as the Kansas Wheat Commission and Kansas Crop Improvement Association, but the majority of costs are funded

by taxpayers. Private companies must recoup fixed investments made in the research and development of their varieties, which makes their varieties higher-priced relative to public varieties.

The AREI winter wheat seed price is the aggregate of data collected by surveys from 10 states. The 10 states were Colorado, Idaho, Kansas, Montana, Nebraska, Oklahoma, Oregon, South Dakota, Texas, and Washington. The April cash price for these 10 states was collected from 1992 to 1999 using the USDA National Agriculture Statistics Service (NASS) *Published Estimate Database* for winter wheat. The September Kansas cash price for winter wheat also was obtained from this database.

The difference between the composite April seed price and the composite April cash price for winter wheat provided the price spread used to estimate Kansas seed price in September. The price spread between the composite seed and cash prices in April was added to the September Kansas cash price of winter wheat to provide an estimate for certified seed price in Kansas from 1992 to 1999. This calculation was performed based on the assumption that Kansas certified seed price in September is a function of the September cash price of wheat plus certification costs. Table 1 shows the price information used to estimate the September cost of certified seed in Kansas.

Custom Cleaned and Treated Farmer-Saved Wheat Seed Cost Estimate

The cost per bushel of farmer-saved seed was estimated using the Kansas July cash price and adding costs for storage, interest, cleaning and treating a portion of the seed, labor, and the costs associated with cleanout.

Storage costs are the sum of physical storage and interest. Physical storage costs were based on USDA's *Summary of Offer Rates for Country Elevators* and these commercial storage rates were \$0.026 per bushel per month or \$0.078 for 3 months. Interest costs for 3 months were calculated by multiplying the July cash price by 2.25 percent (9 percent annual rate).

Wheat seed custom cleaning and treatment costs were taken from *Kansas Custom Rates* (various issues). Rather than assuming 100 percent of farmer-saved seed is cleaned and treated, the values reported in *Kansas Custom Rates* were weighted by the averages reported by Stanelle et al. (e.g., 82 percent of the wheat was cleaned and 36 percent was treated).

Labor costs associated with farmers saving back their own seed will vary considerably from operation

Table 1. Estimated Kansas Certified Seed Cost, Dollars per Bushel, 1992-1999

Year	April Composite Certified Seed Price ^a	April Composite Cash Price ^b	Price Spread ^c	Kansas September Cash Price ^b	Certified Seed Cost Estimate ^d
1992	\$7.41	\$3.53	\$3.88	\$3.05	\$6.93
1993	7.73	3.07	4.66	2.86	7.52
1994	7.90	3.15	4.75	3.59	8.34
1995	7.80	3.42	4.38	4.64	9.02
1996	8.50	5.81	2.69	4.22	6.91
1997	10.00	4.39	5.61	3.39	9.00
1998	8.31	2.89	5.42	2.37	7.79
1999	7.35	2.41	4.94	2.33	7.27
Average	\$8.13	\$3.58	\$4.54	\$3.31	\$7.85

^aSource: USDA's Agricultural Resource and Environmental Indicator (AREI) Update (10-state composite).

^bSource: USDA National Agricultural Statistics Service (NASS).

^cDifference between April Composite Certified Seed Price and the April Composite Cash Price.

^dSum of the September Cash Price and the Price-Spread.

Table 2. Estimated Farmer-saved Wheat Seed Cost for Kansas, Dollars per Bushel, 1992-1999

Year	July Cash Wheat Price ^a	Storage Cost ^b	Cleaning Cost ^c	Treatment Cost ^c	Labor Cost	Cleanout Cost ^d	Farmer-saved Cost Estimate ^e
1992	\$3.07	\$0.146	\$0.262	\$0.169	\$0.200	\$0.207	\$4.05
1993	2.74	0.139	0.312	0.173	0.207	0.197	3.77
1994	3.02	0.145	0.312	0.155	0.214	0.209	4.05
1995	4.28	0.173	0.336	0.191	0.221	0.273	5.47
1996	5.03	0.190	0.344	0.137	0.229	0.305	6.23
1997	3.15	0.148	0.336	0.198	0.236	0.223	4.29
1998	2.50	0.133	0.353	0.158	0.243	0.191	3.58
1999	2.15	0.126	0.361	0.169	0.250	0.177	3.23
Average	\$3.24	\$0.150	\$0.327	\$0.169	\$0.225	\$0.223	\$4.34

^a Source: USDA National Agricultural Statistics Service (NASS).

^b Storage cost is calculated as the sum of the physical cost of commercial storage (\$0.026 per bushel per month) and interest for three months (2.25 percent multiplied by the July cash price).

^c Cleaning and treatment costs are based on rates from Kansas Custom Rates (KASS) and assuming 82 and 36 percent of the farmer-saved seed is cleaned and treated, respectively.

^d Cleanout cost is based on 10 percent of cleaned bushels removed and valued at 50 percent of the wheat price.

^e Equal to the sum of the Cash Price, Storage Cost, Cleaning Cost, Treatment Cost, Labor Cost, and Cleanout Cost.

to operation due to varying time requirements and valuation of labor. For example, some farmers may place a low value on their time if they have limited opportunities while others may place a much higher value on their time if they have other opportunities or needs for their labor. Labor costs associated with farmer-saved seed were assumed to average \$0.225 per bushel.

Cleanout refers to the portion of the seed that is removed during the cleaning process because it is not viable seed (i.e., cracked kernels, etc.). The cost associated with cleanout is due to (1) the physical cost of cleaning and (2) the lower value that cleanout material has from wheat. If the value of material "cleaned out" was equal to the price of wheat, the only cost associated with cleaning the grain would be the cleaning charge itself. However, because cleanout material typically has a lower value than wheat, this represents an additional cost associated with cleaning

that needs to be accounted for. It was assumed that 10 percent of the bushels cleaned would be removed and this cleanout material was valued at 50 percent of the price of wheat. Table 2 provides the information used to estimate the cost of farmer-saved seed for Kansas from 1992 to 1999.

Certified and Farmer-saved Wheat Seed Comparison

Table 3 compares the estimated costs of certified and farmer-saved wheat seed. The average difference was \$3.51 per bushel. The average certified seed price was 1.81 times greater than the farmer-saved seed price. Figure 1 shows the relationship between the wheat price at harvest (July) and the price spread between certified and farmer-saved seed at planting time (September-October). The underlying cash price of wheat grain is an important factor in determining the difference between the farmer-saved and certified seed

Table 3. Comparison of Certified and Farmer-saved Seed Cost Estimates, Dollars per Bushel, 1992-1999

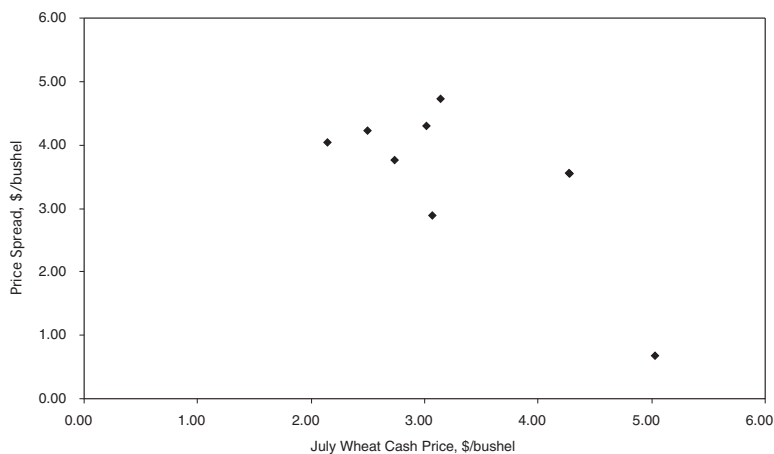
Year	Certified Seed Cost Estimate ^a	Farmer-saved Cost Estimate ^b	Difference ^c
1992	\$6.93	\$4.05	\$2.88
1993	7.52	3.77	3.75
1994	8.34	4.05	4.29
1995	9.02	5.47	3.55
1996	6.91	6.23	0.68
1997	9.00	4.29	4.71
1998	7.79	3.58	4.21
1999	7.27	3.23	4.04
Average	\$7.85	\$4.34	\$3.51

^aThe Certified Seed Cost Estimate is taken from Table 1.

^bThe Farmer-saved Cost Estimate is taken from Table 2.

^cDifference between Certified Seed Cost Estimate and Farmer-saved Cost Estimate.

Figure 1. Spread between Certified and Farmer-saved Seed Cost Estimates vs Wheat Cash Price, 1992 to 1999



costs. These data suggest that as the price of wheat increases, the price spread decreases. This negative relationship between wheat cash prices and the spread between farmer-saved and certified seed costs is the result of wheat cash prices being relatively more variable than certified seed costs over time.

Inputs such as fertilizers, lime, herbicides, and insecticides are considered critical for producers to realize yield goals. Seed is a small percentage of the overall cost of production. For example, the Kansas Farm Management Association reported that seed costs were 4 percent of total variable and fixed costs for 589 non-irrigated Kansas wheat farms in 1999 (Langemeier and DeLano). Ali, Brooks, and McElroy reported no variability in certified and farmer-saved seed costs for wheat producers in the south central United States. Certified wheat seed has a higher cost, per pound and per acre of wheat planted, compared to farmer-saved seed.

The return from using certified seed versus farmer-saved seed can be calculated using a partial budget. A

partial budget simply compares the increased (decreased) revenue and costs associated with some management decision relative to a base scenario. Here, the management decision is certified seed and the base scenario is farmer-saved seed. In addition to the differences in seed costs (as shown in Table 3), other revenue and cost changes that may occur need to be included in the partial budget. For example, if the seeding rate differs between certified and farmer-saved seed, that difference needs to be accounted for. Likewise, if yields and/or prices differ (i.e., revenue), that needs to be included in the partial budget.¹ Most crops harvested by custom harvesters in Kansas have a base charge per acre and some additional cost above some level (i.e., higher yields increase the cost of harvest and hauling). This marginal cost associated with harvesting more bushels should also be included in a partial budget if there are yield differences.

Table 4 shows a partial budget for certified seed versus farmer-saved seed based on the average seed costs given in Table 3. In addition to seed cost differences, this example assumes a slightly higher seeding rate for farmer-saved seed and a one-bushel yield advantage with certified

seed. Based on the assumptions in this example, the returns to seed are slightly higher for farmer-saved seed compared to certified seed (\$0.33/acre). This implies that in order for certified seed to be profitable, either the yield advantage needs to increase or the price spread (cost difference) needs to narrow. Because the seeding rate and yield differences were simply assumed for this example and because costs likely vary considerably between producers, it is important that producers use their own numbers when evaluating the economics of certified seed.²

¹ Generally, if there is a difference with regards to income between certified and farmer-saved seed it will be yield driven. There is little reason to expect price would vary simply because certified seed is used. This may be the case with some identity preserved programs, however, it is important to also include any costs associated with maintaining identity of the grain. In other words, the price premium may be more related to the identity preserved aspect of the grain than to the fact that it was produced from certified seed.

² An Excel® spreadsheet (Certified Seed.xls) can be found at www.agecon.ksu.edu/kdhuyvetter to estimate the returns of certified seed versus farmer-saved seed based on producers own cost estimates using a partial budget as displayed in Table 4.

Table 4. *Partial Budget for Comparing the Economics of Certified and Farmer-saved Seed*

Cost of certified seed, \$/bu ^a				\$7.850	
Harvest price of farmer-saved seed, \$/bu				\$3.240	
Storage cost	0.026	\$/bu/mo	90 days	0.078	
Interest cost	90	days	9% interest rate	0.072	
Cleaning cost	0.400	\$/bu	82% cleaned	0.328	
Treating cost	0.470	\$/bu	36% treated	0.169	
Labor cost	0.225	\$/bu		0.225	
Cleanout cost	1.620	\$/bu	10% cleanout	0.223	
Cost of farmer-saved seed, \$/bu ^b				\$4.335	
Price spread (certified less farmer-saved), \$/bu				\$3.515	
Certified/farmer-saved ratio				1.81	
Marginal harvest/hauling cost, \$/bu				\$0.245	
			<u>Certified</u>	<u>Farmer-saved</u>	<u>Difference^c</u>
Seeding rate, lbs/ac ^d			60	66	-6.0
Expected yield, bu/ac ^d			41.0	40.0	1.0
Expected price, \$/bu			\$3.00	\$3.00	\$0.00
Gross returns, \$/ac			\$122.76	\$120.00	\$2.76
Seed cost, \$/ac			\$7.85	\$4.77	\$3.08
Return to seed, \$/ac			\$114.91	\$115.23	\$ -0.33

^a Certified seed cost estimate is taken from Table 1.

^b Farmer-saved seed cost estimate is taken from Table 2.

^c Difference equals certified minus farmer-saved.

^d Differences in seeding rate and yield are assumptions for this example. Producers are encouraged to conduct a similar analysis using values reflective of their situations (see footnote 2 on page 4).

Table 5. *Return per Bushel of Certified Seed Using a Predicted Price Spread between Certified Seed and Custom Cleaned and Treated Farmer-saved Seed*

Wheat Price \$/bushel ^a	Improved Yield Per Bushel Planted						Predicted Price Spread, \$/bu
	0.0	0.5	1.0	1.5	2.0	2.5	3.0
2.50	-4.26	-3.01	-1.76	-0.51	0.74	1.99	3.24
2.75	-4.01	-2.63	-1.26	0.12	1.49	2.87	4.01
3.00	-3.76	-2.26	-0.76	0.74	2.24	3.74	5.24
3.25	-3.50	-1.88	-0.25	1.37 ^b	3.00	4.62	6.25
3.50	-3.25	-1.50	0.25	2.00	3.75	5.50	7.25
3.75	-3.00	-1.12	0.75	2.63	4.50	6.38	8.25
4.00	-2.75	-0.75	1.25	3.25	5.25	7.25	9.25

^a Wheat price is net of any marginal harvest and hauling cost.

^b For example, a 1.5 bushel increase in yield per bushel planted when the price of wheat is \$3.25 per bushel yields \$4.875 in added revenue per bushel (\$3.25 x 1.5). The added cost equals the average price spread of \$3.50. Thus, net revenue is \$1.37 (\$4.87 - \$3.50).

As shown in Figure 1, the price spread between farmer-saved and certified seed likely changes in response to supply and demand conditions (i.e., it is a function of wheat prices). Using the average price spread of \$3.51 per bushel would understate the returns to certified seed when cash prices are high and overstate net returns when wheat prices are low. Thus, a regression equation was used to predict the price spread between certified and farmer-saved seed as a linear function of the July cash price.

Table 5 shows the return per bushel of certified seed planted (assumes seeding rate is the same for certified and farmer-saved seed) for various yield increases with certified seed at multiple selling prices.

The predicted price spread is contained in the last column of the table. An increase in yield of 2 bushels has a positive return when the price of wheat is \$2.50 or higher per bushel. However, with a yield increase of only 1 bushel, price needs to be \$3.50 per bushel or higher in order for certified seed to increase returns relative to farmer-saved seed.

Implications

Certified wheat seed has additional value when considering the current and potential future trends of production agriculture. Identity-preserved systems are increasingly being used by food and

agribusiness firms such as General Mills (Willis), Farmland Industries (Blades), and Cargill.

Opportunities for Kansas's wheat producers continue to develop as more wheat varieties are developed for specific end uses. If these varieties have sufficient differentiated characteristics such that they reduce a miller or baker's cost or improves producer yields, variety certification will become even more important. Kansas is the largest wheat flour milling state and flour millers who are using marketing contracts in identity-preserved production systems also require the use of certified wheat seed. Future identity-preserved systems may likely require planting certified seed of a certain variety and keeping it segregated from other wheats. However, there will continue to be markets for non-identity preserved wheat and hence, many producers will likely continue to use farmer-saved wheat seed.

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This research was funded by the USDA.

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Kansas State University Agricultural Experiment Station and Cooperative Extension Service

MF-2498

July 2001

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